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Research Article

Effectiveness Of Stem Approach on Academic Performance of Primary School Students as Perceived by Their Teachers

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ABSTRACT

The impact of the STEM (Science, Technology, Engineering, and Mathematics) strategy on primary school pupils' academic achievement is examined in this study. Through the integration of interdisciplinary disciplines, the STEM approach seeks to foster critical thinking, problem-solving, and experiential learning. This study assesses the effects of using STEM-based teaching methods on students' performance in fundamental subjects including science, technology, and mathematics. To examine the connection between STEM education and academic achievement, data was gathered via experimental research and student performance evaluations. The findings show that students' understanding, involvement, and capacity to apply knowledge in real-world contexts are all considerably enhanced by the STEM method. However, obstacles including inadequate funding and teacher readiness hinder the broad adoption of STEM methods. The study comes to the conclusion that, with sufficient support and training for teachers, implementing the STEM method in elementary school can improve academic achievement, encourage creativity, and better prepare pupils for learning in the future.

Key words: critical thinking, problem-solving, experiential learning, STEM-based teaching.

INTRODUCTION

Rapid scientific and technological breakthroughs have changed the face of education and highlighted the need for creative teaching methods that give students the tools they need to succeed in the twenty-first century. A dynamic framework for developing students' critical thinking, creativity, and problem-solving skills is the STEM (Science, Technology, Engineering, and Mathematics) method. The STEM approach combines several disciplines to give students practical, hands-on learning experiences, in contrast to traditional teaching techniques that frequently segregate subjects.

This study looks at how well primary school instructors think the STEM approach affects their kids' academic achievement. Since they are the main observers of students' development and the facilitators of learning, teachers are essential to the success of any educational reform. Their o pinions offer insightful information about the ways in which STEM education affects students' academic performance, levels of engagement, and capacity for problem-solving. This study intends to clarify the advantages and difficulties of applying the STEM method in primary education by comprehending the viewpoints of instructors.

It is crucial to equip students with the abilities to handle challenging issues and welcome innovation in a world that is changing quickly. This study adds to the larger conversation on enhancing educational outcomes using contemporary, multidisciplinary approaches by highlighting the significance of implementing STEM strategies to improve academic achievement at the elementary level.

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Statement of the problem

Despite the growing emphasis on STEM (Science, Technology, Engineering, and Mathematics) approach to enhance academic performance in primary schools, there is limited empirical research exploring its perceived effectiveness from the perspective of teachers. This study aims to investigate how primary school teachers in Tamil Nadu perceive the impact of the STEM approach on students' academic performance. By understanding these perceptions, the study seeks to identify the strengths, challenges, and necessary support for effective STEM implementation in primary education, thereby contributing valuable insights to educators, policymakers, and curriculum developers.

Need and significance of the study

This research also contributes to the existing body of literature on STEM approach, particularly in the Indian context, by emphasizing the often-overlooked perspective of educators. Lastly, the findings can promote greater community awareness and support for STEM initiatives in primary schools, fostering a collaborative environment that prioritizes STEM approach. Overall, this study is expected to provide valuable insights that can benefit not only teachers and students but also the broader educational system in Tamil Nadu.

OBJECTIVES OF THE STUDY

1. To find out the significant difference between retention test scores of control and experimental group.
2. To find out the level of academic performance of the primary school students after STEM approach integration.
3. To find out the effect of STEM approach module on the academic performance of primary school students.

NULL HYPOTHESES

1. There is no significant difference between gain scores of control and experimental group in their academic performance.
2. There is no significant difference between retention scores of control and experimental in their academic performance.
3. There is no significant effect of STEM approach on academic performance of primary school students.
4. There is no significant difference between post-test score of control group and experimental group of primary school students in their academic performance

METHOD

The experimental method is a scientific method which involves the manipulation of variables to establish the cause-and-effect relationships. Experimentation is an investigation in which the hypotheses are scientifically tested. In the experiment, the independent variable is manipulated and the dependent variable is measured. The experimental method is more valid and less biased (McLeod, S. A, 2012).

ANALYSIS

There is no significant difference between retention score of control group and experimental group of primary school students in their academic performance.

Table-1: t-test for the retention scores of control group and experimental group of primary school students in their academic performance

Academic Performance	Group	N	Mean	SD	t value	P value	Remarks
Knowledge & Understanding	Control	30	24.43	6.590	27.386	0.000	S
	Experimental	30	69.67	7.246			
Skills & Strategies	Control	30	24.03	8.173	16.160	0.000	S
	Experimental	30	48.77	3.401			
Integration	Control	30	14.83	2.520	20.575	0.000	S
	Experimental	30	29.67	3.220			
Thinking skills	Control	30	17.30	3.515	17.73	0.000	S
	Experimental	30	30.50	2.502			
Value Development	Control	30	21.23	5.463	19.904	0.000	S
	Experimental	30	48.87	4.584			
Academic Performance overall	Control	30	101.83	11.396	41.579	0.000	S
	Experimental	30	227.47	11.163			

S-Significant at 5% level, NS-Not Significant at 5% level

In the above table, since the p-value for academic performance is less than 0.05, the null hypothesis is rejected at 0.05 level of significant. Hence, it is concluded that there is significant difference between retention scores of control and experimental group of primary school students in their academic performance and its dimensions namely, knowledge and understanding, skill and strategies, integration, thinking skills and value development.

Gain Score Analysis (Academic Performance)

There is no significant difference between gain score of control group and experimental group of primary school students in their academic performance.

Table-2: t-test for the gain scores of control group and experimental group of primary school students in their academic performance

Academic Performance	Group	N	Mean	SD	t value	P value	Remarks
Knowledge & Understanding	Control	30	0.70	9.466	20.532	0.000	S
	Experimental	30	46.90	9.038			
Skills & Strategies	Control	30	1.50	11.611	11.473	0.000	S
	Experimental	30	22.20	5.985			
Integration	Control	30	2.00	3.648	17.169	0.000	S
	Experimental	30	17.27	3.868			
Thinking skills	Control	30	3.53	5.975	12.443	0.000	S
	Experimental	30	18.30	3.640			
Value Development	Control	30	1.30	7.813	18.321	0.000	S
	Experimental	30	29.43	4.790			
Academic Performance overall	Control	30	6.03	18.715	30.209	0.000	S
	Experimental	30	134.10	18.155			

S-Significant at 5% level, NS-Not Significant at 5% level

In the above table, since the p-value for academic performance is less than 0.05, the null hypothesis is rejected at 0.05 level of significant. Hence, it is concluded that there is significant difference between gain scores of control and experimental group of primary school students in their academic performance and its dimensions namely, knowledge and understanding, skill and strategies, integration, thinking skills and value development.

Pre and Post-test of Control Group (Academic Performance)

There is no significant difference between pre-test and post-test mean scores of control group of academic performance of primary school students in their academic performance.

Table-3: t-test for the pre-test and post-test mean scores of control group of academic performance of primary school students in their academic performance

Academic Performance	Group	N	Mean	SD	t value	P value	Remarks
Knowledge & Understanding	Pre-test	30	23.97	6.371	0.405	0.688	NS
	Post-test	30	24.67	8.273			
Skills & Strategies	Pre-test	30	26.27	6.258	0.708	0.485	NS
	Post-test	30	24.77	9.358			
Integration	Pre-test	30	13.07	2.258	3.003	0.005	S
	Post-test	30	15.07	3.362			
Thinking skills	Pre-test	30	13.93	3.503	3.239	0.003	S
	Post-test	30	17.47	4.524			
Value Development	Pre-test	30	20.20	5.235	0.911	0.370	NS
	Post-test	30	21.50	6.345			
Academic Performance overall	Pre-test	30	97.43	12.602	1.766	0.088	NS
	Post-test	30	103.47	15.431			

S-Significant at 5% level, NS-Not Significant at 5% level

In the above table, since the p-value academic performance is less than 0.05, the null hypothesis is rejected at 0.05 level of significant. Hence, it is concluded that there is significant difference between pre-test and post-test mean scores of control group of academic performance of primary school students in their integration and thinking skills.

Since the p-values for other than integration and thinking skills of pre-test and post-test mean scores of control group is greater than 0.05, the null hypothesis is accepted at 0.05 level of significant. Hence it is concluded that there is no significant difference between pre-test and post-test mean scores of control group

of primary school students in their in their knowledge and understanding, skills and strategies, value development and academic performance.

Pre and Post-test scores of Experimental Group (Academic Performance)

There is no significant difference between pre-test and post-test mean scores of experimental group of academic performance of primary school students in their academic performance.

Table -4: t-test for the pre-test and post-test mean scores of experimental group of academic performance of primary school students in their academic performance

Academic Performance	Group	N	Mean	SD	t value	P value	Remarks
Knowledge & Understanding	Pre-test	30	22.70	3.239	28.423	0.000	S
	Post-test	30	69.60	8.447			
Skills & Strategies	Pre-test	30	26.63	3.837	20.316	0.000	S
	Post-test	30	48.83	3.364			
Integration	Pre-test	30	12.70	2.120	24.451	0.000	S
	Post-test	30	29.97	3.337			
Thinking skills	Pre-test	30	12.23	2.473	27.534	0.000	S
	Post-test	30	30.53	2.921			
Value Development	Pre-test	30	19.50	2.529	33.656	0.000	S
	Post-test	30	48.93	4.386			
Academic Performance overall	Pre-test	30	93.77	10.061	40.457	0.000	S
	Post-test	30	227.87	15.489			

S-Significant at 5% level, NS-Not Significant at 5% level

In the above table, since the p-value academic performance is less than 0.05, the null hypothesis is rejected at 0.05 level of significant. Hence, it is concluded that there is significant difference between pre-test and post-test mean scores of experimental group of primary school students in their knowledge and understanding, skills and strategies, integration, thinking skills, value development and academic performance.

CONCLUSION

The STEM approach has been shown to be a successful teaching method for raising primary school pupils' academic achievement. Teachers believe that STEM-based instruction improves students' critical thinking, problem-solving, and engagement, especially in science and maths. Even though the strategy has a lot of academic advantages, issues like teacher readiness and scarce resources need to be resolved to optimize its effects. All things considered, integrating STEM into elementary school gives pupils the tools they need to succeed in the classroom and in the real world.

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